The algebraical character of the paper needs a word. Instead of using a coordinate system and ordinary algebra, the authors develop a vector-algebra whose expressions represent directly the geometrical entities under discussion, and which in itself is unchanged by the changes in the axes of reference. This algebra is based upon the notions of Gibbs, and is the same as was developed by Lewis.[1] A rather complete development is given, including the analysis, or differential calculus of these vectors. In terms of the constancy of one of the vectors defined, the vector of extended momentum, the laws of conservation of mass, energy and momentum, are deduced, as well as fields of gravitational force and potential. It is not possible to enter into detail, as the technical character of the developments would demand a large amount of space to do them justice. However, any one desiring a complete and elegant account of the relativity theory, as it is seen in a geometric setting, will find it here. The laws of electromagnetics and mechanics are seen to be theorems in this geometry, which means of course that the representation as a non-Euclidean geometry of four dimensions is not only a fair representation, but is a complete representation of all the facts. It is not to be concluded, however, that it is the only representation; others have been suggested, which do not introduce the notion of a four-dimensional space in the sense it has above.[2] It should be pointed out, however, that the electrodynamic equations remain unaltered if we substitute a distance X for ct and at a time for x given by cT. So that if the universe is four-dimensional and we are moving with the velocity of light in one of the four directions of the fundamental axes, we can not tell which one it is, and indeed it makes no difference. Which means in the end (does it not?) that as we assumed in the beginning that the only thing we could measure absolutely is velocity, therefore, all distances must be expressed as velocities, that is, as times, or conversely, that time as we view it is a distance. Indeed this is the fundamental assumption of the whole theory, that we may never know correctly absolute distance (if there be such a thing) nor absolute time, but we do know correctly absolute velocity.

The memoir is interesting also to mathematicians as a study of a particular non-Euclidean space and the corresponding vector algebra. It illustrates in a very happy way the great simplification introduced into a problem when we apply the proper symbolic analysis.

JAMES BYRNIE SHAW

[1] *Proc. Amer. Acad. Arts and Sci.*, 46: 163–182.

[2] Timerding, *Jahresb. d. Math. Ver.*, 21: 274–285, 1913.

Introduction into Higher Mathematics for Scientists and Physicians. By Dr. J. SALPETER. Jena, Verlag von Gustav Fischer. Pp. 336.

This book has the advantage—as compared with similar previous works—of being written in a very elementary and yet thoughtful fashion. The author has succeeded very well in explaining the principles of higher mathematics in an exceedingly plain way, yet so that he gives all the essential points. For instance, the first three chapters of the book (32 pages or about one tenth of the whole book) are exclusively devoted to a most detailed and elaborate explanation of the three fundamental conceptions upon which higher mathematics are based. These are: (1) the conception of the limiting value of an infinite series of figures; (2) the conception of a function; and (3) the conception of the derivation of a function. To explain the importance and real meaning of these fundamentals the author uses much space, and especially cites a great number of examples from different domains of natural science. In view of the purpose of this work, however, this explanation is not too long. After this introduction only, the technique of differentiating is discussed, also very clearly. Maxima and minima of functions, differential equations, integration, etc., are then explained thoroughly and clearly. At the end of each chapter numerical examples are given, as well as applications to scientific problems. The graphic method is extensively used. As a whole, the book can be recommended to such experimental investigators

who wish to make themselves acquainted with mathematical methods in a limited time. The importance of mathematics for all branches of natural science will certainly increase the more our knowledge progresses and increases in complexity, because it becomes more and more difficult to draw conclusions by non-mathematical reasoning. A book of such character as the one described can certainly therefore claim to be of great importance.

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Chloride of Lime in Sanitation. By Albert H. Hooker. First Edition. New York, John Wiley & Sons. 1913.

One of the most striking developments in the art of water purification during recent years has been the rapid increase in the use of chloride of lime as a disinfectant. It has been found that astonishing results may be obtained by the use of surprisingly small quantities of this substance. In clear water, such as that of the Great Lakes, the application of eight to ten pounds of this chemical to a million gallons of water is sufficient to destroy practically all of the bacteria. Larger amounts are required for waters which contain organic matter, in some instances nearly one hundred pounds per million gallons being used. Bleaching powder is also being used to some extent in the disinfection of sewage. Here, also, it has an important field of usefulness.

The rapidity with which the use of this substance has come into popular favor is indicated by the publication of the present work devoted exclusively to the use of chloride of lime in sanitation, and consisting chiefly of abstracts of articles published in various scientific journals. Four hundred of these articles are quoted and the essential points of each briefly stated. The author deserves credit for having brought these various papers together. It would be a tedious matter for any one interested in this topic to obtain so much information by his own search. Looking for omissions the reviewer finds that the compilation has been unusually well made.

The abstracts are prefaced with an interesting discussion of the general subject by the author, who gives first a history of the manufacture of chloride of lime and then an account of the method of its use in water purification and for other purposes of general disinfection. In this he is somewhat inclined to minimize the advantages of the use of liquid chlorine. He regards the action of bleaching powder as one of oxidation and does not believe that chlorine acts by itself as a disinfectant in any other way than by liberating nascent oxygen. Some may be inclined to question this. One of the most valuable sections of the book is that which gives directions for dissolving bleaching powder for its practical application. Comparatively little is said in regard to the corrosion of metals by the use of this chemical.

The book is well indexed and will prove an invaluable reference book to sanitary engineers.

George C. Whipple

The Plant Alkaloids. By Thomas Anderson Henry, Superintendent of Laboratories. Scientific and Technical Department, Imperial Institute. Philadelphia, P. Blakiston's Son & Co. 1913.

So long as there is a science of botany, phytochemistry will constitute a perfectly justifiable phase of chemical thought and of chemical investigation. Though for a time, after Kekulé's enunciation of structural chemistry, phytochemistry was looked upon as being not fully up to date as compared with organic synthesis, it is again coming to its own. Since Emil Fischer has pointed out that some of the most interesting problems of organic chemistry are those that are intimately related to biochemistry, phytochemistry has once more become a respectable science even in the eyes of the synthetic chemist.

The present activity in this field is manifested not only by innumerable special researches, but by the rapid growth of book literature. Thus Czapek's "Biochemie der Pflanzen," Euler's "Grundlagen und Ergebnisse der Pflanzenchemie," and Wehmer's "Pflanzenstoffe," which have appeared within a short